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Exciting science is happening at Brookhaven National Laboratory! Our latest research could mean future advances in the treatment of cancer, sustainable energy alternatives, and the better design of batteries. Read excerpts below from stories written by members of Brookhaven's Media and Communications Office.

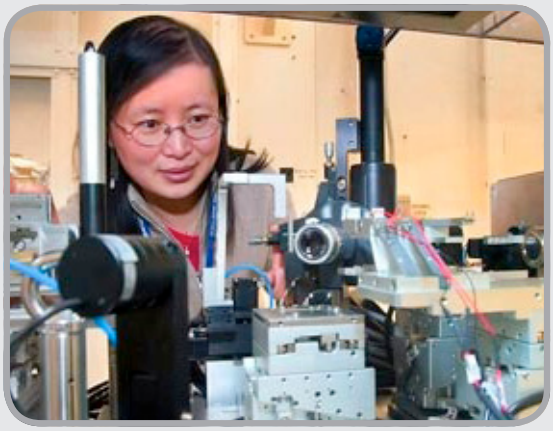
Brookhaven Partners in Isotope Research

Scientists from the U.S. Department of Energy's (DOE) Los Alamos National Laboratory and Brookhaven National Laboratory have developed a new method to rapidly produce a radioactive isotope used to treat cancer. The current need for the isotope, actinium-225 (Ac-225), is far greater than the supply made possible by the traditional method of production, and the annual demand is growing. The 200 million-electron-volt proton beam of the Brookhaven Linac Isotope Producer (BLIP) is ideally suited to further advance the new method of producing the alpha-emitting isotope.

One of the primary barriers to wider use of Ac-225, which attacks cancer cells, has been the lack of an economically viable supply. Using proton beams, Los Alamos and Brookhaven could match current annual worldwide production in just a few days, overcoming critical shortages of this therapeutic isotope. A collaboration formed by Los Alamos, Brookhaven, and Oak Ridge national laboratories is developing a plan for full-scale production and a stable supply of Ac-225.

Estimates are that two to three years of production scale-up and process development will be required before Ac-225 can be produced routinely.

New Microscope Captures Tiny Structures in Dazzling 3D



BNL's transmission x-ray microscope

Imagine taking thousands of photographs of a single object, a soccer ball, say – obsessively capturing it from every angle to expose all the details. But what if that soccer ball was the size of a skin cell, its patterns were smaller than airborne viruses, and you *really* needed over a thousand photos to know its structure?

That's the challenge that researchers at Brookhaven overcame with a new transmission x-ray microscope (TXM), which successfully combined 1441 images of a lithium-ion battery electrode into a detailed 3D structure. The TXM, hooked up to an x-ray beamline at BNL's National Synchrotron Light Source, probes the inner intricacies of materials smaller than human cells and creates unparalleled high-resolution 3D images. By integrating unique automatic calibrations, the TXM is able to capture and combine thousands of images with greater speed and precision than any other microscope.

While the TXM will focus on alternative energy solutions, the demonstrated success of the 3D imaging system has already attracted the interest of commercial users, with major corporations such as UOP and IBM scheduling time at the TXM. The Defense Advanced Research Projects Agency (DARPA) also plans to use the new microscope to probe the intricate structures of imported microchips in the interest of national security.

Happenings

- **June 7** – Brookhaven Women in Science Colloquia Series, "Surfing with Wavelets," presented by Ingrid Daubechies, 4 PM, Berkner Hall Auditorium
- **June 13** – Distinguished Lecture, "The Future of Nuclear Physics in the U.S.," Timothy Hallman, DOE Associate Director of Science for Nuclear Physics, 5-6 PM, Berkner Hall
- **June 14** – Community Advisory Council, 6:30 PM, Bldg. 490, Medical, Large Conference Room
- **June 20** – Brookhaven Lecture, 4 PM, Berkner Hall Auditorium

*The events above are free and open to the public. Visitors 16 and over must bring a photo ID for access to BNL events.

Splitting Hydrogen from Water

Hydrogen gas offers one of the most promising sustainable energy alternatives to limited fossil fuels. But traditional methods of producing pure hydrogen face significant challenges in unlocking its full potential, either by releasing harmful carbon dioxide into the atmosphere or requiring rare and expensive chemical elements such as platinum.

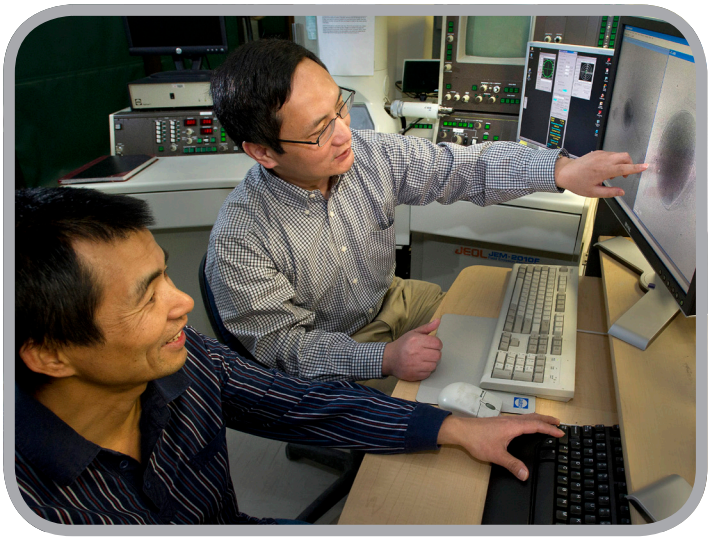
Now, scientists at Brookhaven have developed a new electrocatalyst that addresses one of these problems by generating hydrogen gas from water cleanly and with more affordable materials. In this new catalyst, nickel takes the place of platinum, metallic molybdenum is introduced to enhance reactivity, and nitrogen is added to alter the electronic states of the nickel-molybdenum combination.

The novel form of catalytic nickel-molybdenum-nitride surprised scientists with its high-performing nanosheet structure, introducing a new model for effective hydrogen catalysis. The nanosheet structures offer highly accessible reactive sites and therefore more reaction potential.

While this catalyst does not represent a complete solution to the challenge of creating affordable hydrogen gas, it does offer a major reduction in the cost of essential equipment.

Understanding DNA Replication

Before any cell – healthy or cancerous – can divide, it has to replicate its DNA. So scientists who want to know how normal cells work — and perhaps how to stop abnormal ones — are keen to understand this process. As a step toward that goal, Brookhaven scientists and collaborators from Stony Brook University, Cold Spring Harbor, and MRC Clinical Science Centre, Imperial College, London, have deciphered molecular-level details of the complex choreography by which intricate cellular proteins recognize and bind to DNA to start the replication process. Because DNA replication is so closely tied to cell division, a thorough understanding of the process may lead to new ways to fight the uncontrolled cell division that characterizes cancer.



BNL biologists study DNA replication

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BROOKHAVEN NATIONAL LABORATORY

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